Supplementary Materials

Plasmon-Enhanced Fluorescence of EGFP on Short-Range Ordered Ag Nanohole Arrays

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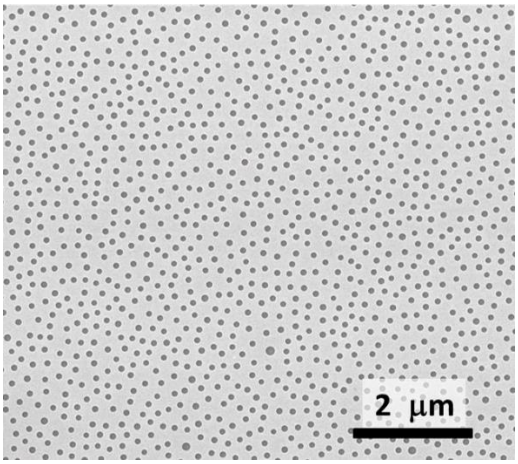

Figure S1. Typical SEM image of two-dimensional nanohole array fabricated using sparse colloidal lithography with 120 nm latex nanospheres.

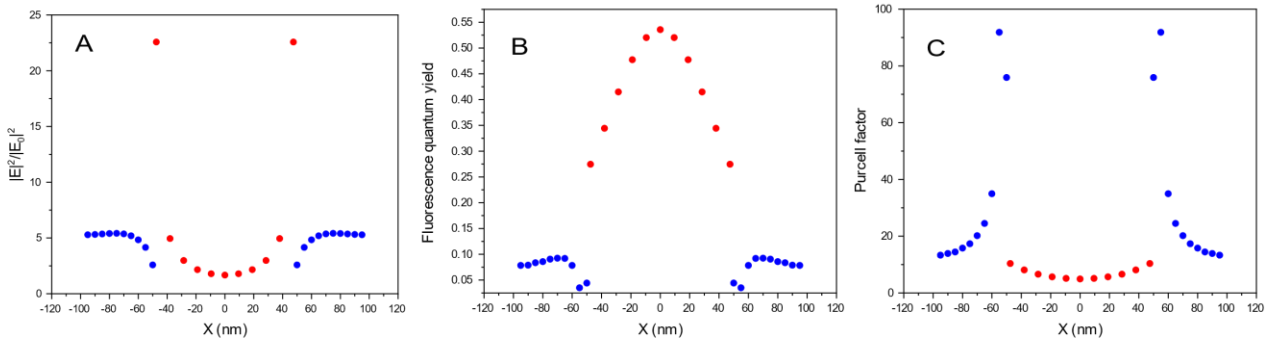

Figure S2. Simulation of the EGFP fluorescence enhancement near 100 nm AgNHA: **A**) electric field enhancement $|E|^2/|E_0|^2$; **B**) Fluorescence quantum yield; **C**) Purcell factor.

Derivation of the relation for a fluorescence lifetime change

The excited state lifetime τ of the fluorophore is defined by the rate constants of radiative k_{fl} and non-radiative k_{nr} relaxation processes:

$$\tau^0 = \frac{1}{k_{fl}^0 + k_{nr}^0} \tag{1}$$

where index "0" denotes processes in the absence of metal.

The quantum yield φ is then defined by:

$$\varphi^0 = \frac{k_{fl}^0}{k_{fl}^0 + k_{nr}^0} \tag{2}$$

In the presence of metal, the radiative rate constant can be changed due to a Purcell effect, and a new non-radiative energy transfer process with the rate constant k_{loss}, can take place, therefore the relations (1) and (2) will be transformed into

$$\tau = \frac{1}{k_{fl} + k_{nr}^0 + k_{loss}} \tag{3}$$

and

$$\varphi = \frac{k_{fl}}{k_{fl} + k_{nr}^0 + k_{loss}} \tag{4}$$

The relative change of the excited state lifetime can be found by dividing (1) by (3):

$$\frac{\tau^0}{\tau} = \varphi^0 \left(\frac{k_{fl}}{k_{fl}^0} + \frac{k_{loss}}{k_{fl}^0} - 1 \right) + 1 \tag{5}$$

Similarly, one can obtain the relation for the quantum yield:

$$\varphi = \varphi^0 \frac{k_{fl}}{k_{fl}^0} \frac{\tau}{\tau^0} \tag{6}$$